

# Hi-Frequency, Low Power Nanowire Nanoelectrochemical Field-Effect Transistors

Tech ID: 23794 / UC Case 2013-239-0

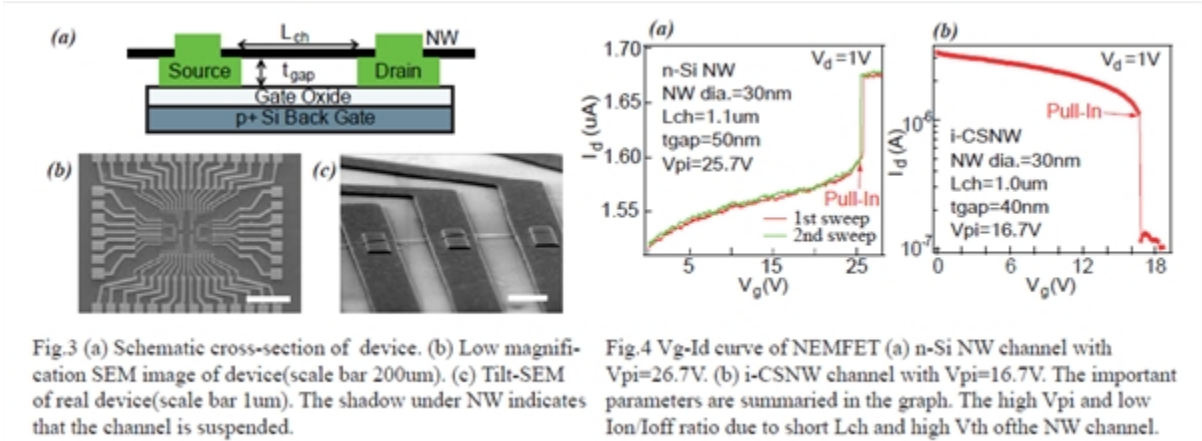
## BACKGROUND

Conventional silicon-based transistors face limitations in continued reduced dimensions in order to make electrons move faster. Meanwhile thermodynamics are dictating the amount of power consumed at the off state - by limiting the subthreshold slope of conventional transistors to be at least 60 mV/dec. Motivated by Moore's Law, the following technology advances the effort to build low power computer logic and memory elements with even more speed.

## TECHNOLOGY DESCRIPTION

Engineers from UC San Diego have developed a novel nanoscale transistor structure that is based on both electrical transport and mechanical deformation in semiconductor nanowire materials and operates under a new mechanism of coupled nanoelectromechanical motion in order to achieve high switching speed as well as low standby power. Compared to traditional MEMS mechanical switches, a suspended field-effect channel does not rely on mechanical contacts with the gate electrode thus offer the advantage of high reliability. More specifically, this technology achieves a sub-threshold slope of zero by leveraging a high-mobility one dimensional nanowire platform.

This device is poised to provide a building block for future computation.



## APPLICATIONS

Low power, high speed transistors (cell phone, computing devices). Disruptive semiconductor technology.

## STATE OF DEVELOPMENT

Technology is available for commercial development, patent protection available for US.

## RELATED MATERIALS

- ▶ Kim JH., Chen ZC., Kwon S., Xiang J. Three-terminal nanoelectromechanical field effect transistor with abrupt subthreshold slope. Nano Lett. 2014 Mar 12;14(3):1687-91. doi: 10.1021/nl5006355. Epub 2014 Feb 28. PubMed PMID: 24568680. - 02/28/2014
- ▶ Kim JH., Zack C.Y. Chen, S. Kwon and J. Xiang. Steep Subthreshold Slope Nanoelectromechanical Field-Effect Transistors with Nanowire Channel and Back Gate Geometry IEEE Explore (Figs. 3 & 4 inset above). - 01/01/2013

## PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,793,417	10/17/2017	2013-239

## CONTACT

University of California, San Diego  
Office of Innovation and  
Commercialization  
[innovation@ucsd.edu](mailto:innovation@ucsd.edu)  
tel: 858.534.5815.



## OTHER INFORMATION

### CATEGORIZED AS

- ▶ **Nanotechnology**
- ▶ Other
- ▶ **Semiconductors**
- ▶ Other

### RELATED CASES

2013-239-0

**University of California, San Diego**  
**Office of Innovation and Commercialization**  
9500 Gilman Drive, MC 0910, ,  
La Jolla,CA 92093-0910

Tel: 858.534.5815  
innovation@ucsd.edu  
<https://innovation.ucsd.edu>  
Fax: 858.534.7345

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